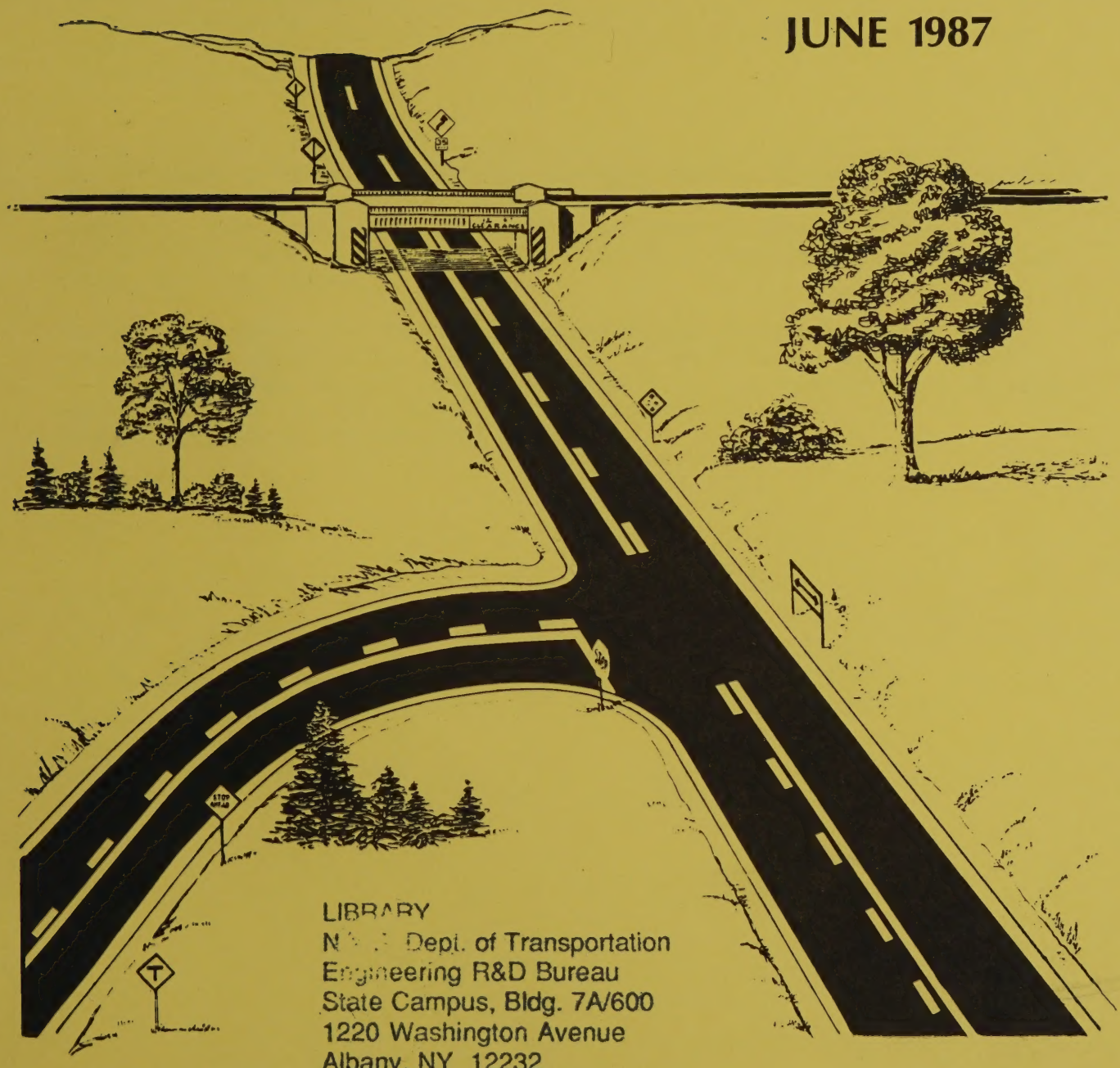
PAVEMENT MARKING POLICY

TECHNICAL
SERVICES
DIVISION

JUNE 1987



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NEW YORK STATE DEPARTMENT OF TRANSPORTATION
MARIO M. CUOMO, Governor FRANKLIN E. WHITE, Commissioner

MEMORANDUM
DEPARTMENT OF TRANSPORTATION

TO: Assistant Commissioners
Division Directors
Regional Directors
Bureau Directors

The following is the Department's new Pavement Marking Policy which establishes the goal of having cost-effective year-round pavement marking on all our State highways. This is the first of what I expect will be several policy and guideline statements to implement cost-effective, comprehensive infrastructure maintenance strategies.

The policy document also details the organizational responsibilities and scheduling and coordination requirements to effectively implement this policy. To this end, I specifically call your attention to the implementation schedule beginning on page 8, and expect that each of you will fulfill your responsibilities by the specified date.

Approved:

Charles E Carlson

Charles E. Carlson
Deputy Commissioner
for Departmental Operations

6/18/87
Date

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NEW YORK STATE DEPARTMENT OF TRANSPORTATION

PAVEMENT MARKING POLICY

TECHNICAL SERVICES DIVISION

June 5, 1987

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EXECUTIVE SUMMARY

Consideration has been given by the Department's executive staff, and operations and technical personnel to make changes in pavement marking policy. This report provides information on the new policy.

The Department has set a goal of providing pavement markings on the State System on a year-round cost-effective basis.

The new policy provides for:

- °Contract placement of durable marking materials on high volume roadways including interstates, expressways and urban arterials, and remote highways when operationally cost effective.
- °Maintenance placement of improved traffic paint on other roadways.
- °Initial striping on new pavements by a mix of maintenance and contract forces, depending upon the project situation.
- °Management and coordination of the overall marking program by Traffic and Safety.

Included in this report are details on objectives, current program, revised program, organizational responsibilities, implementation, and program implications.

POLICY ON PAVEMENT MARKINGS

I. INTRODUCTION

Department executive, operations, and technical staff have had under consideration plans to improve the pavement marking program. The goals of year-round cost-effective markings has been established and basic decisions have been made on future policy. (See Appendix A for Commissioner's Budget Presentation). The Technical Services Division was directed to develop a policy statement which would provide operational and implementation details. This report includes information on current policy and presents the future policy, its implementation and program implications.

II. CURRENT POLICY/PROGRAM

A. GENERAL

The current policy results in the use of a combination of materials applied by both State Forces and Contractors. Contract operations include the application of long-line and special durable pavement markings (thermoplastic, epoxy and preformed tape) on capital projects. A limited amount of traffic paint is also applied by contract. Several Regions also use durable marking contracts to restripe existing highways. Maintenance operations include the application of long-life traffic paint on the entire system on an annual basis, except for those portions marked with durable materials in serviceable condition. Maintenance also uses both preformed tape and paint for special markings. (See Appendix B for definition of terms).

B. COSTS

As detailed in Appendix C, the total annual cost of the current program in 1985 was $17.7 million of which $10.4 million were for markings applied by contract and $7.3 million for markings applied by Department maintenance forces. Of this total, $13.7 million were expended for long-line markings, and $4.0 million for special markings.

C. CONCERNS

The major concerns with the current program include the following:

(1) The existing program results in mixed material combinations on the system, creating operational inefficiencies and performance variations. A more systematic program is needed.

(2) The paint used by Maintenance does not provide year-round durability in many cases. Improved durability is required.

(3) The durable pavement marking materials, while considered generally cost-effective and providing year-round delineation, have yielded variable performance. Technical improvements are required.

(4) Contractor application of durable pavement markings on capital projects has posed scheduling problems, performance problems and higher unit costs.

(5) Program coordination between contract and Maintenance operations should be improved.

(6) A Department program manager with overall responsibility for the entire pavement marking program is needed.

III. OBJECTIVE

The objective of this revised policy is to systematically provide for effective year-round pavement markings on the most cost effective basis. A combination of materials applied by State Forces and Contractors using a combination of capital and operating funds shall be used to meet the objective.

IV. REVISED POLICY/PROGRAM

A. MAJOR ELEMENTS

The revised policy consists of the following major elements:

-Maintain current Maintenance striping resources and capabilities.
-Use a combination of materials (durable pavement markings and paint).
-Install/maintain durable markings on limited access and high volume highways and remote highways when operationally cost effective by contract.
-Install/maintain improved paint on lower traffic highways by Maintenance.
-Include durable long-line markings as part of capital projects when large quantities of markings are to be applied.
-Do not include durable long-line markings in capital projects with either lower traffic volumes or small marking quantities.
-Provide initial paint striping on new pavements (not receiving durable markings) by either maintenance or contractor forces as detailed in this policy.
-Include special pavement markings in capital projects.
-Establish annual Region-wide durable pavement marking striping/restriping contracts.
-Use a combination of funding within current levels.
-Assign program coordination to the Traffic and Safety Division.
-Continue to improve technology.
-Provide sufficient flexibility for operational needs, technology and funding changes.

B. POLICY DETAILS

The following provide additional details on the major elements listed above:

(1) Durable markings shall be installed and maintained by contract on all interstate highways, limited access expressways, four-lane urban arterials with an AADT greater than 10,000 and two-lane urban arterials with an AADT greater than 5,000. Durable markings may also be installed on highways located a substantial distance from a pavement marking crew reporting site when shown to be cost effective. The use of durable markings on these highways shall be approved on a case by case basis by the Assistant Commissioner for Operations. Other highways may be considered for durable markings on an exception basis.

(2) Traffic paint shall be installed and maintained by Maintenance on all other highways. The current Maintenance policy which requires a minimum of one annual restriping of both center and edgelines or multiple restripings as needed, will be continued until performance experience is gained with improved paint.

(3) Durable long-line markings shall be included in capital construction projects involving paving provided they meet the qualifying traffic criteria in (1) above and the total striping quantities exceed 100,000 linear feet. Durable special markings should be included in all capital construction projects as needed.

(4) Durable markings shall no longer be included in projects not meeting either the traffic or quantity criteria in (1) and (3) above. For those qualifying highways requiring smaller quantities of durable pavement markings, the required markings shall be provided by the Regional marking contracts (See (6) below). For those highways not qualifying for durable markings, the initial markings shall be provided by Maintenance forces or where necessary by inclusion of paint items in the construction contract. For projects with a total of 10,000 lf of lines or more, and where the provisions of Section 619-3.06 "Pavement Delineation" of the specifications permit a period of 28 days to complete the final striping, paint lines will be installed by Highway Maintenance. For smaller quantities, and for projects where striping must be completed within 7 days, paint items will be included in the contract.

(5) Materials: The following combinations of materials shall be used:
-Paint: Modified alkyd traffic paint will continue to be used until an improved traffic paint becomes operational. It is planned to use a chlorinated rubber paint in Region 4 in 1987 on a pilot basis -- see Appendix D for evaluation plan. Assuming satisfactory pilot results, a Statewide conversion to chlorinated rubber paint is planned for 1988. Maintenance may use paint for special markings when appropriate.
-Durable markings: Contracts will specify the use of thermoplastic pavement marking material for new asphalt concrete pavements, and epoxy pavement markings on new concrete pavements and for restriping all aged pavements. Preformed tape may be use for special markings and in certain long-line applications such as lighted areas for either contract or Maintenance work. Raised pavement markers may be used in limited situations as provided by current policy.

(6) To provide for the capability to install durable markings either on qualifying capital projects that don't meet minimum quantity criteria or to restripe existing qualifying highways, each Region shall annually design and let durable pavement marking contract(s). These contracts, based on materials selection (epoxy is the material of choice for long-line work), will include requirements for cleaning the pavement as needed and installation of durable pavement markings on multiple sites at varying times. Minimum quantities for these contracts should be 250,000 linear feet.

(7) Funding. A combination of capital and operations funds will be used.

(8) Each Region will develop a Regional pavement marking plan incorporating the above criteria. The plan will identify the highways to be striped/restriped by contract and by State forces. In addition, Regions will prepare each year a Regional Annual Marking Program detailing proposed contract and Maintenance marking activities for the coming year.

(9) The purpose of this policy is to provide a systematic pavement marking program. It is recognized however, that flexibility is required to handle operational needs, technology and funding changes and as described below, the Director, Traffic and Safety Division, is assigned the overall responsibility and authority to manage this program.

V. ORGANIZATIONAL RESPONSIBILITIES

A. The Director, Traffic and Safety, is designated as the Program Manager for the overall pavement marking program. This program responsibility and authority includes approval of the Regional pavement marking plans, evaluation of the cost-effectiveness of all products in use, and modifying this policy as the need arises.

B. The Director, Highway Maintenance, will continue to be responsible for State applied pavement markings including budgeting for personnel, materials and equipment, and management of the program.

C. The Director, Facilities Design, is responsible for developing and issuing guidelines for the preparation of PS&E'S for pavement marking contracts, for the inclusion of durable long-line pavement markings in eligible paving contracts when the quantity is 100,000 linear feet or more, and for the inclusion of durable special markings in all contracts where appropriate.

D. The Director, Technical Services, is responsible for continuing research and development, preparation of specifications, quality assurance, construction assistance, approval of new products for inclusion in the program, and related pavement marking activities.

E. The Director, Program Planning and Management Group, is responsible for programming and funding from R&P or other appropriate funds, one or more durable pavement marking contracts for each Region to be let in January through March of each year to provide for the striping or restriping of qualifying highways.

F. Regional Responsibilities

(1) The Regional Director is responsible for the preparation, review, and approval at the Regional level of both the Regional pavement marking plan and a Regional annual marking program.

(2) The Regional Planning Engineer is responsible for having PIR's prepared for Regional pavement marking contract(s) and to arrange funding from R&P or other appropriate Regional allocations.

(3) The Regional Traffic Engineer is responsible for the survey and inventory of the condition of the durable pavement markings in the Region, and preparation of the Regional pavement marking plan. The Regional Traffic Engineer is also responsible for coordinating the restriping program with the Regional paving program to ensure that durable pavement markings will not be applied to highways scheduled to be paved before the expected life of the durable pavement marking has been achieved.

(4) The Regional Design Engineer is responsible for the timely preparation of PS&E's for Regional marking contract(s) and for forwarding PS&E's to the Facilities Design Division by a date which will permit contracts to be let between January through March.

(5) The Regional Construction Engineer is responsible for the supervision of the installation of durable markings under contract and also for coordination with the Regional Highway Maintenance Engineer to schedule application of traffic paint when needed on completed pavements.

(6) The Regional Highway Maintenance Engineer is responsible for the condition survey and application of all pavement markings by State forces. The Regional Highway Maintenance Engineer is also responsible for documenting the cost effectiveness of installing durable pavement markings by contract on those highways remotely located from pavement marking crew reporting sites.

VI. IMPLEMENTATION

A. GENERAL

The combinations of materials and projects used to date have resulted in an inconsistent mix of pavement markings on the highway system. Is is therefore necessary to develop and implement a plan that works toward the goal of marking and maintaining higher volume pavements with durable markings and others with paint. The general approach is initially to identify and quantify those highways to receive durable markings and those to receive paint and to determine needs for initial striping and restriping. After phase-in, it is estimated that approximately 30% of the interstates, limited access expressways and urban arterials will annually require marking.

B. REGIONAL MARKING PLAN

(1) General

For this policy to be effective, it is essential that the Regions develop detailed operational plans on a continuing basis that take into account Region-wide needs and coordination of contract and Maintenance marking operations.

(2) Initial System Definition

This policy requires that the following categories of roadways be marked with durable markings:

- Interstates
- Limited access facilities
- Urban arterials, 4 lanes, AADT greater than 10,000
- Urban arterials, 2 lanes, AADT greater than 5,000

It is recognized that a strict interpretation of these criteria would result in an undesirable mixing of markings within corridors. Therefore, the Regional Traffic Engineer in coordination with the Regional Maintenance Engineer should develop a plan of the Regional system that considers the above criteria but adjusts to provide for reasonable continuity along corridors.

The Regional Highway Maintenance Engineer shall also prepare the cost analysis documenting the cost effectiveness of using durable pavement

markings on any remotely located highways selected by the Region to be marked by the durable marking contract. The cost analysis should compare the life cycle cost of paint applied by State forces and durables applied by contract. The analysis should include all costs incurred by the State, including personnel, travel, lodging, overtime, materials and equipment costs. The cost effectiveness documentation should be submitted with the Regional Pavement Marking Plan.

After review and approval by the Regional Director, the plan shall be submitted to the Director, Traffic and Safety Division, for approval. The Director, Traffic and Safety Division, will forward to the Assistant Commissioner for Operations with a recommendation, all requests and documentation for the use of durable markings on remotely located highways. The total of the eleven Regional marking plans shall be the Department's pavement marking plan and will be the basis used to prepare annual budgets for capital and maintenance work.

(3) System Inventory/Future Plans

It is important both initially and on a continuing basis for each Region to know the type, age and condition of their markings and pavements. This information is essential to determine restriping needs on a continuing basis, especially for durable markings. While marking condition is important, pavement condition and future plans are equally important. It is not cost effective to place durable markings on pavement in poor condition or one scheduled for work within the expected life of the durable markings. This inventory work is the responsibility of the Regional Traffic Engineer in coordination with the other Regional Groups.

C. CONTRACT MARKING PROGRAM

This policy provides for contract long-line durable markings in two ways; (1) inclusion of durable markings in eligible construction contracts with sufficient quantities; (2) Regional durable marking contracts.

As previously noted, special markings will be applied on construction contracts, regardless of traffic volume and materials quantities.

(1) Eligible Construction Contracts

A revised Engineering Instruction will be issued by the Facilities Design Division that advises designers on markings to be included in individual contracts involving pavement work. It will include:

- Materials selection (Thermoplastic on new asphalt, epoxy on new concrete, preformed tape for special markings and some long-line applications).
- Long-line durable markings should be included if project is eligible and quantities exceed 100,000 lf.
- Preformed tape special markings will be included on contracts.
- For contracts not including contractor applied long-line durable markings, a determination shall be made to either: (1) schedule the project for marking by the Regional durable marking contract; (2) schedule the contract for painting by Maintenance; or (3) when necessary, include paint items in the contract. Paint items will be included in the contract only when the total marking quantity is less than 10,000 lf, or the final markings must be installed within 7 days of the completion of paving, as outlined in Section 619-3.06 "Pavement Delineation" of the Specifications.

- To reduce the cost of contract applied paint striping, a new specification will be prepared by Technical Services. This item will be more flexible than the current paint item, and will permit the use of portable walk-behind stripers.

(2) Regional Durable Marking Contracts
Additional instructions will be issued by the Traffic and Safety Division on Regional durable marking contracts and will include:
- Materials selection (epoxy will generally be required for original and restriping on both asphalt and concrete pavement with other materials considered in special situations). -Scheduling of new construction projects that are eligible for durable markings but don't include items in the construction contracts due to small quantities or other reasons.
- Scheduling restriping on existing pavements. (approximately 30% of qualifying roadways on an annual basis)
- Inclusion of contingency quantities.
- Total contract quantity should exceed 250,000 lf.

D. MAINTENANCE MARKING PROGRAM
Under this policy, Maintenance will be responsible for applying and maintaining painted markings on all roadways not striped with durable markings and maintaining all special markings. In addition, Maintenance will assist in marking construction projects requiring paint as detailed in Sections IV-B(4) and VI-C. For Maintenance special projects, markings should be applied in accordance with the general policy by either the Regional durable marking contract(s) or by painting. Currently some roadways marked with durable markings would not qualify under this policy. As these wear out, Maintenance will repaint them on a continuing basis. Current practice for budgeting, funding, and operations will continue.

E. COORDINATION/SCHEDULING
Close coordination at the Regional level is required between Planning, Traffic, Design, Construction and Maintenance. The following paragraphs describe a suggested scenario for coordination and scheduling. With the goal of having Regional durable marking contract(s) awarded by May, the Regional Traffic Engineer will survey durable markings in the Region each Fall and prepares a list of highways to be marked with durable markings the following year. In addition, the Traffic Engineer will coordinate with the Regional Design Engineer and Regional Construction Engineer to identify pavements to be resurfaced the following year which need to be marked under the Regional durable marking contract(s).

Necessary details for durable markings will be provided to the Regional Planning Engineer who will prepare PIR's, and to the Regional Design Engineer, who will prepare PS&E's for Regional durable marking contracts. The contracts will include sufficient flexibility and contingencies to accommodate unavoidable changes in paving schedules. All PS&E's will be submitted to the Facilities Design Division in time for January through March lettings the following year. This will permit all Regional marking contracts to be awarded by May allowing early restriping of pavements with badly worn markings.

Temporary pavement markings applied to the final pavement surface by a general contractor are expensive and not cost effective. Therefore, to

the maximum extent practicable, the final pavement markings should be applied to the final pavement surface. As provided by Section 619-3.06 Pavement Delineation, of the Specifications, full delineation is required after either 7 or 28 day periods. Within 7 or 28 days of final paving, durable markings should be applied by the Regional marking contracts or paint should be applied by Maintenance or the contractor as detailed in Sections IV-B(4) and VI-C.

The Regional Construction Engineer will coordinate between the paving contractors and the Regional marking contractor(s) to ensure that, to the maximum extent possible, eligible pavements completed in the Fall are striped with durable markings if durable markings are not included in the construction contract. The Regional Construction Engineer will also coordinate with the Regional Highway Maintenance Engineer to have State forces apply painted markings to completed contracts not striped using durable markings or contract-applied traffic paint.

Every Spring, the Regional Traffic Engineer will update the pavement marking survey and provide a list of priority location to the Regional Maintenance Engineer and Regional Construction Engineer where markings have worn out and should be striped first. Included in this list will be new eligible pavements from the previous year where durable markings could not be applied because of late completion or other problems.

F. IMPLEMENTATION SCHEDULE

The goal is to have this policy fully operational in 1988. To accomplish that goal, the following steps must be completed by the dates indicated.

	Action	Responsibility	Date
1.	Final pavement marking policy submitted to Deputy Commissioner for Departmental Operations.	Director, Technical Services Division	6/15/87
2.	Reviews and approves policy.	Deputy Commissioner for Departmental Operations	6/22/87
3.	Policy transmitted to Regional Directors and Main Office Program Managers.	Director, Technical Services Division	6/23/87
4.	Pavement markings industry contractors and suppliers informed of new policy.	Director, Technical Services Division	7/1/87
5.	Revised specifications prepared for contractor-applied paint lines.	Director, Materials Bureau	8/15/87

6.	Guidelines for preparation of PS&E's for pavement marking contracts and inclusion of durable markings in eligible contracts developed and issued.	Director, Facilities Design Division	8/15/87
7.	Regional pavement marking plans completed and submitted to Director, Traffic & Safety Division.	Regional Directors of Transportation	9/1/87
8.	Regional pavement marking plans reviewed, revised as necessary, and approved.	Director, Traffic and Safety Division and Assistant Commissioner for Operations	10/15/87
9.	Policy becomes effective for all contracts let after this date.	--	11/1/87
10.	PIR's for 1988 Regional pavement marking contracts submitted to Program Planning and Management Group.	Regional Planning Engineers	11/1/87
11.	PS&E's for 1988 Regional pavement marking contracts submitted to Final Plan Review Bureau.	Regional Design Engineers	12/1/87-2/1/87
12.	Let 1988 Regional pavement marking contracts.	Director, Program Planning & Management Group	2/1/87-4/1/87
13.	Evaluation of Region 4 chlorinated rubber pilot program. (a) installation report (b) performance report	Director, Engineering Research & Development	 Fall 1987 Summer 1988
14.	Repeat steps 10-12 for subsequent years.		1988-
15.	Review affect of policy on bid prices.	Director, Technical Services Division	4/1/88
16.	Review pavement marking policy.	Director, Traffic and Safety Division	6/1/89
17.	Evaluate performance of pavement markings.	Director, Engineering Research & Development Bureau.	6/1/89

VII. PROGRAM IMPLICATIONS

This section contains a simplified analysis to demonstrate long-line marking program quantities and costs.

The system (based on data obtained from the Data Services Bureau) includes the following:

	℄ Miles		Lane Miles	
Interstates	916		4,397	
Other limited access	1,440	4,124	5,894	14,975
Urban Art., 4/lane, AADT > 10,000	575		2,298	
Urban Art., 2/lane, AADT > 5,000	1,193		2,386	
Other	11,381		24,363	
TOTAL	15,505		39,338	

Based on the new policy, 4,124 ℄ miles would be maintained with durable markings and 11,381 ℄ miles would be maintained with paint.

The following is a general summary of past annual marking activity (based on data provided by Traffic and Safety):

	℄ Miles	Cost ($million)
Maintenance paint	14,370	$ 6.5
Contract durable pavement markings	1,075	7.0
Contract painted pavement markings	60	0.2
*Total	15,505	$13.7

Under the new policy, after a transition period, annual marking activity would be as follows:

	℄ Miles	Cost ($million)
Maintenance paint	11,166	$ 7.0
Contract durable pavement markings (30% each year)	1,240	7.1
Contract Paint	215	0.3
TOTAL	12,621	$14.4

The 40% increase in installed unit cost of the improved paint is partially offset by a 22% reduction in mileage. Future additional savings may be expected due to reduced restriping frequency. The 15% increase in annual durable markings ℄ mileage will be offset by reductions in unit prices due to larger contract quantities and improved scheduling and coordination. Longer service lifes may also reduce costs. The anticipated changes are contained in the $14.4 Million total. After a transition period, the goal of year-round long line markings can be achieved for approximately a 5% increase in overall funding.

Special marking costs in 1985 totalled $4.0 million; $0.8 by Maintenance and $3.2 million by capital contract. No changes are proposed for special markings.

* * * * * * * *

APPENDIX A - COMMISSIONER'S BUDGET PRESENTATION

Extracted from Commissioner White's budget presentation, October 1986:

"PUBLIC SAFETY

The Department has long had a commitment to protecting public safety on our highways. This dedication, coupled with technological improvements, has been the impetus for several initiatives this year.

For many years the Department has sought a pavement marking material which could stand up to the high traffic volumes and difficult weather conditions which are typical of many of our highways. For the past several years, we have been using an epoxy marking material to stripe new pavement after completion of a capital rehabilitation project. Because the distances to be covered were often relatively short, the price for the material was high and the resulting short stretches of well marked highway were not always the locations where good markings were most critical. In a shift of policy, with no increase in costs, we are going to use the funds which we normally use for epoxy striping on capital projects to put epoxy paint on one-third of our interstate highways. We anticipate that this will allow us to establish a three-year cycle for restriping the entire interstate highway system and ensure that these, our most heavily traveled highways, will always be well marked.

We are also requesting your support for a $2.0 million initiative to upgrade the type of pavement marking material used by our State crews. For many years, the Department has used inexpensive but very short lived modified alkyd paint for pavement striping. As many drivers have noted, this material often wears off before our crews can restripe a particular section. We are seeking to switch to chlorinated rubber paint which is more expensive, but which normally lasts about twice as long as the alkyd paint. We consider this improvement essential to preserving the safety of motorists who must use pavement markings to avoid inappropriate and dangerous actions."

APPENDIX B - DEFINITIONS/MATERIALS CHARACTERISTICS

Long-line Markings

Center lines, lane lines, edge lines, and hatch lines.

Special Markings

Stop lines, crosswalks, arrows, words, symbols, lane lines at intersections meeting durable marking traffic volume criteria.

Durable Pavement Markings

Pavement marking materials intended to provide multi-year service lives for most traffic situations. Durable markings in common use by the Department include:

1. Epoxy - a two-component material containing epoxy resins, pigments and fillers. The two components are heated and mixed immediately prior to spray-application.

2. Thermoplastic - alcohol or petroleum based resins with thermoplastic properties (melt at elevated temperature) mixed with pigment, fillers and glass beads. Applied by extrusion device in molten state at high temperature, solidifies to form solid line.

3. Preformed tape - factory fabricated markings, packaged as rolls, sheets, or symbols and letters, with pre-applied adhesive. Applied by hand or machine applicator to finished pavement and rolled or tamped to achieve initial bond.

Other durable markings used by the Department on a limited basis include:

4. Epoxy thermoplastic (EPT or epoflex) - a thermoplastic marking material using an epoxy resin instead of alcohol or petroleum based resins. Applied at high temperature by spray application.

5. Polyester - two-component material containing polyester resin, pigment and filler, and a hardener applied through a separate spray nozzle. Material is spray-applied at ambient or slightly elevated temperature, with mixing occuring externally at the pavement surface.

Traffic Paint

Solvent-borne marking materials containing solvent, resin and pigment. Paints are most often spray-applied at elevated temperature. Traffic paints generally provide a service-life of 1 year or less.

The Department currently specifies paint containing a modified-alkyd (MA) resin, but is evaluating chlorinated-rubber (CR).

Regional Pavement Marking Plan

Inventory of all pavements within a Region specifying pavement type and condition, system classification, traffic, number of lanes, current pavement marking type, and proposed pavement marking type under criteria of this policy.

Pavement Marking Plan

Statewide pavement marking plan compiled from Regional plans.

Regional Annual Marking Program

Proposed listing of pavement markings in a Region to be installed in a calender year. Includes location, marking type, means of installation (Hwy Maint., capital contract, or durable pavement marking contract).

Annual Marking Program

Statewide annual marking program compiled from Regional plans.

Regional Durable Pavement Marking Contract

Capital contract for installation of durable markings at various locations within a region within a calender year. One or more contracts may be initiated within a Region each year depending on the specific needs of the Regional program. Minimum contract quantity should normally be 250,000 lf of striping, and be limited to one material type.

MATERIALS CHARACTERISTICS

Material	Projected Cost, $/ft.(1)	Service Life(2)	Pavt. Types(4)
MA Paint (Maint.applied)	0.025	6 mo.	All
CR Paint (Maint.applied)	0.035	1 yr.	All
CR Paint (Cont.-truck)	0.18	1 yr.	All
CR Paint (Cont.-portable)	0.06	4 mo.	All
Epoxy	0.25(3)	3 yr.	PCCP, exst. ACP
Thermoplastic	0.30	4 yr.	New ACP
Preformed Tape	1.50	4 yr.	All

(1) projected 1987 installed cost when used in compliance with this policy.

(2) projected typical service life when used in compliance with this policy.

(3) Includes $0.20/ft material cost and $.05/ft. pavement preparation cost.

(4) Durable markings are not to be used on pavement in deteriorated condition or scheduled for major rehabilitation or overlay such that the expected service life cannot be realized.

APPENDIX C

PAVEMENT MARKING COST DATA-1985

COST SUMMARY

MARKING TYPE	PROGRAM	ITEM(1)	QUAN. (mi.)	QUAN. %	UNIT COST ($/ft)	TOTAL COST ($mill.)	COST %
Long-line	Maint. (Paint)	MA	48,620	93.3	0.025	6.5	36.7
"	Cap. (Durables)	TP	2,280	4.4	0.34	4.1	23.2
"	" "	EP	860	1.6	0.29	1.3	7.4
"	" "	PT	120	0.2	1.70	1.0	5.6
"	" "	Clean	530	-	0.20	0.6	3.4
"	" (Paint)	MA	245	0.5	0.18	0.2	1.1
Spec.Mrk.	Maint.	-	-	-	-	0.8	4.5
"	Cap.		-	-	-	3.2	18.1
			52,125	100		17.7	100

COSTS BY PROGRAM - (ALL MARKINGS)

	Cost	%
Maint.	7.3	41
Cap.	10.4	59
	17.7	100

COSTS BY MARKING TYPE

	Cost	%
Long-line	13.7	77
Spec. Mrk.	4.0	23
	17.7	100

COSTS BY PROGRAM/(LONG-LINE)

	Cost	%
Maint.	6.5	47
Cap.	7.2	53
	13.7	100

(1) MA-Mod.Alk. Traffic Paint; TP-Thermoplastic; EP-Epoxy; PT-Preformed Tape.

Appendix D -Evaluation of Chlorinated Rubber
Traffic Paint Installation - Region 4

Background - In cooperation with the Materials Bureau and the Highway Maintenance Division, the Engineering Research and Development Bureau has been involved in a search for an improved traffic paint since 1981. Based on results of accelerated wear tests from 1981 through 1983, to be published in Research Report 137, chlorinated rubber traffic paint offers the best durability of any paint currently available.

In 1982, 3,300 gallons of CR traffic paint was installed in Region 2 - see Research Report 125. While good durability was achieved, handling problems and safety concerns resulted in a continued search for another paint. In 1984, 500 gallons of another CR paint were installed in Region 4. Not only was its durability excellent, but the problems experienced in Region 2 were averted. Based on these results, plans were advanced for the 1987 pilot installation in Region 4. A contract has now been awarded for the delivery of 90,000 gallons of paint beginning in the spring of 1987. The Engineering Research and Development Bureau will work with Highway Maintenance in Region 4 and adjoining regions to conduct the evaluation.

Evaluation - This evaluation will be conducted under an existing HP&R project, with the study proposal to be prepared by ER&D Bureau. Both the installation and durability of the chlorinated rubber paint will be documented and compared to control sections of the Department's standard modified alkyd traffic paint. This CR paint will be placed by Region 4 striping crews at test sites on highways adjacent to regional boundaries, and the MA paint will be placed by adjacent regions on adjoining sections of the same highway. By placing both paints at approximately the same time, a closely controlled comparison of the two paints will be obtained at a minimum of 15 locations.

The evaluation will compare the durability and application characteristics of the CR paint to the current MA paint, with the objective of obtaining improved durability with no compromise in application and handling characteristics. ER&D Bureau personnel will evaluate both parameters by carefully documenting the installation of the CR paint, and by a series of periodic inspections of both materials until each has worn out. The following evaluation criteria will be applied:

1. Application

storage characteristics - does the material harden, separate, or deteriorate during normal storage

pumping - can the material be readily loaded into the striping equipment using conventional mixing and pumping equipment

sprayability - can the material be applied through current equipment without clogging, leaks, etc.

line appearance - the overall appearance of the lines - crispness, uniformity, etc. will be monitored

dry time - are dry times close to the 60 seconds now achieved with MA paint so tracking can be averted using current line protection methods?

safety precautions - product safety data sheets will be assessed to determine whether this product presents any significant increase in risk in terms of toxicity, flamability, or other health or safety concerns

availability, acceptability - compliance with the initial purchase contract will be documented to determine whether industry can supply product to meet current specifications

2. Durability

material condition - evaluated objectively using ASTM standard procedures to rate condition and appearance

reflectivity - nighttime visibility will be measured using a retroreflectometer now owned by ER&D Bureau

Reports - Following the completion of installation, a brief memo report will be prepared giving the results of the first phase of the evaluations. Periodic condition surveys will be continued through the spring of 1988, at which time a second memo report will be prepared to document durability. Eventually, a formal research report will also be prepared to fulfill the requirements of the HR&R Program, and to provide permanent documentation of the results.

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